Prof. Weismann himself seems hardly to realize how inevitable such a conclusion is. If it be admitted that unicellular organisms acquire new characters under the operation of external influences, it cannot consistently be doubted that this also takes place in germ-cells.

It seems to be necessary, therefore, to modify the conception of variation founded upon the above-quoted paragraph from p. 277, by introducing into it the operation of external influences upon the germ. We now see that though sexual reproduction greatly promotes variation in consequence of the ever-new combination of ancestral characters in each fertilization, yet another efficient cause of variation is the direct action of external influences on the germ, giving rise to blastogenic characters.

But this modified conception of the causes of variation comes into collision with Prof. Weismann's statement (p. 277) that "the origin of hereditary individual variability cannot indeed be found in the higher organisms—the Metazoa and Metaphyta; but it is to be sought for in the lowest—the unicellular organisms," a collision which is much to the detriment of the latter; for, if it cannot be denied that external influences give rise to blastogenic characters, then it cannot be maintained that "the origin of hereditary individual variability cannot be found in the higher organisms." On the contrary, it must be admitted that the modifying influence of external conditions continually affects not only unicellular organisms, but also the germ-cells of the Metazoa, producing new characters, thus inducing variation, in both.

This conclusion leads to the consideration of a point of great interest. In accordance with his view of the pre-eminent importance of amphigonic reproduction in causing variation, Prof. Weismann asserts the lack of variability in parthenogenetic forms, in the following words (p. 290):—

> "If my theory as to the causes of hereditary individual variability be correct, it follows that all species with purely parthenogenetic reproduction are sure to die out; not, indeed, because of any failure in meeting the existing conditions of life, but because they are incapable of transforming themselves into new species, or, in fact, of adapting themselves to any new conditions. Such species can no longer be subject to the process of natural selection, because, with the disappearance of sexual reproduction, they have also lost the power of combining and increasing those hereditary individual characters which they possess."

The views contained in this paragraph appear to me to be completely at variance with the facts known concerning the Fungi, among plants. Thus, in the Saprolegnieæ, all the known forms, including several genera and many species, are parthenogenetic; the sexuality of the Ascomycetes is still the subject of discussion, but it is admitted that many genera and species of these Fungi are certainly asexual; and the sexuality of the Æcidiomycetes is extremely doubtful. These plants show no apparent tendency to die out, in spite of the absence of sexuality. But it may be replied that these families may be in the stage in which sexuality is just disappearing, and in which they are still adequately adapted to their conditions of life. Such an objection cannot apply, however, to the Basidiomycetes. These Fungi are not only entirely asexual, but it would appear that they have been evolved in a purely asexual manner from asexual ascomycetous or Æcidiomycetous ancestors. The Basidiomycetes, in fact, afford an example of a vast family of plants, of the most varied form and habit, including hundreds of genera and species, in which, so far as minute and long-continued investigation has shown, there is not, and probably never has been, any trace of a sexual process. How are we, then, to account for all the variation which has taken place in this group, quite independently of amphigonic reproduction? On this point Prof. Weismann says (p. 275):—

> "If it could be shown that a purely parthenogenetic species had become transformed into a new one, such an observation would prove the existence of some force of transformation other than selective processes, for the new species could not have been produced by these latter."

It appears to me beyond doubt that, in the Fungi, new species have been developed from parthenogenetic forms, but I leave it to Prof. Weismann to suggest what "force of transformation other than selective processes" may have been operative.

It is not, however, argued that the variation of the higher Fungi is as great as it might have been had they possessed sexuality; for there can be no doubt that sexual reproduction does very materially promote variation. It seems probable, in fact, that the absence of sexuality in these plants may be just the reason why no higher forms have been evolved from them; for in this respect they present a striking contrast to the higher Algæ in which sexuality is well marked.

Since it is clear that new hereditary characters can be produced by the action of external influences on the germ, the outcome of Prof. Weismann's investigation of the phenomena of variation is that he has given prominence to the fact that new hereditary characters need not be apparent in the body of the parent, but that, on the contrary, the somatogenic characters are just those which are least likely to be transmitted. This is essentially the same position, though stated in more precise terms, as that taken up by Darwin, who held that it is not the sudden variations, due to altered external conditions, which become permanent, but those slowly produced by what he termed the accumulative action of changed conditions of life.

With this I close my criticisms, not because there are no other points which might be discussed, but because I have already touched upon many of them in my "Lectures on the Physiology of Plants" (Cambridge, 1886), and because I desire at present to deal solely with the more fundamental parts of the theory. I have, I think, said enough to show that, interesting and suggestive as is Prof. Weismann's theory of the continuity of the germ-plasm, it by no means affords, at least in its present form, so complete and ready an explanation of the facts of embryogeny, heredity, and variation, as the enthusiasm of some of his more ardent disciples would have us believe.

SYDNEY H. VINES.

Oxford, September.

## *NOTES.*

WE regret to announce the death of Mr. John Ball, F.R.S., which took place somewhat suddenly at midnight on Monday last. We understand that the funeral will take place to-morrow (Friday), at 11 a.m., at St. Thomas's, Walham Green.

THE Reports of the Eclipse Expedition of 1886 are at length ready for publication, and will be issued immediately as separate numbers of the Philosophical Transactions. The first, "On the Total Solar Eclipse of August 29, 1886," is by Captain Darwin, Dr. Schuster, and Mr. Maunder; the second, "On the Observations made at the Island of Carriacou," is by the Rev. S. J. Perry; the third, "On the Determination of the Photometric Intensity of the Coronal Light," by Captain Abney and Prof. Thorpe; and the fourth, "On the Observations made at Grenville, in the Island of Grenada," by Mr. H. H. Turner.

THE collection of objects brought back by Prof. Haddon from various islands in Torres Straits is now to be seen in a part of the Eastern Assyrian room at the British Museum, on the upper floor of the north-east angle of the building. Special interest attaches to the anthropological specimens included in this valuable collection.

THE list of names to be recommended for the new Council of the London Mathematical Society at its annual meeting, on November 14, differs from that of last year in the following respect: the names of Prof. Cayley, F.R.S., and of Prof. W. Burnside will be submitted to fill up the vacancies caused by the retirement of Dr. E. J. Routh, F.R.S., and Prof. Hart, of Woolwich.

THE Library of the Royal College of Surgeons will, as an experiment, be, for the remaining portion of the present year, open in the evening. On each week-day except Saturday the hours will be from 11 a.m. to 9 p.m.; on Saturdays the Library will be closed at 1 p.m.

A PHYSICAL SOCIETY is to be formed in Liverpool. It will hold its meetings at University College, and Prof. Oliver Lodge has consented to be nominated as first President. The preliminary meeting will be held in the Physics Theatre of University College, at 8 o'clock on Wednesday evening, November 6, Prof. Oliver Lodge in the chair. The Secretary (*pro tem.*) is Mr. Thomas Tarleton, 1 Hyde Road, Waterloo, Liverpool.

MR. JOHN W. MCCOY, who died in Baltimore lately, bequeathed his library, with 100,000 dollars, to the Johns Hopkins University.

ON Monday a statue of J. B. Dumas, the chemist, was unveiled at Alais, his native town, by M. Faye, French Minister of Agriculture.

LIKE many other schools, Fettes College, Edinburgh, has long been provided with chemical laboratories, but has had no room specially adapted for the teaching of physical science. This want has been met by the construction during the summer of a well-appointed physical laboratory fitted up both for lectures and for practical work by boys themselves. There is a well-arranged supply of gas and water, several stone slabs for delicate instruments affected by oscillations, screens for projection experiments, a heliostat window and system of blinds for darkening the room for experiments on light. A smaller room leading off from the main room is reserved for special work, and is also fitted up as a dark room for photography. The laboratory is close to the boys' workshop, and to the workshop of the resident carpenter and mechanic.

AN interesting Report by Sir Brandford Griffith, Governor of the Gold Coast, has lately been issued by the Colonial Office. It describes at considerable length a tour through the interior of the colony, undertaken for the purpose of investigating the gold deposits and examining the gold-mines at work. The Governor comes to the conclusion that the country is rich in gold, and that it is merely a matter of the necessary time and scientific application for the metal to pay well for extraction. He finds, also, that "earnest and well-considered attempts" are now being made to secure success. An appendix containing a special Report on the Winnebah district and its mineral wealth is added.

AT the first meeting of the new session of the Geological Society of Glasgow, Mr. John Young exhibited a fine series of specimens of Polyzoa and Monticuligrora, comprising over twenty species, which he had this summer discovered at Kirktonhelm, East Kilbride. He remarked that the shale which holds these organisms lies between the first and second Calderside limestones. Most of the specimens were taken from blocks of shale which had been partially burnt in the lime-kilns, the rock in its natural condition being of a gray colour, but changed by contact with heat into yellowish gray. From this change of colour the fronds of the Polyzoa, with their lace-like structure, stand out much more prominently than when the shale is in its original state. They have also the advantage of being very much hardened, whereas the shale is naturally very friable, decomposing almost whenever it is exposed to the action of the weather. Mr. James Bennie, of the Geological Survey of Scotland, read a paper, "Things New and Old from the Ancient Lake of Cowdenglen." Up to 1867 the picturesque little valley of Cowden, beyond Crofthead, on the road to Ayrshire, was not known to possess any features of special geological interest, but in that year, having been chosen as the route of the direct railway to Kilmarnock, it was invaded by the navvy with pick and shovel, to the utter destruction of all its natural beauties. The gradients being steep, the excavations were extensive, and at one point the bed of an ancient lake was cut through, containing deposits of mud and peat lying between two distinct layers of boulder clay. These stratified deposits were found to contain numerous remains of animal and vegetable life, both of higher and lower forms, and, as their presence afforded strong evidence of the great ice age, a controversy arose between the upholders of a single glacial period and those who believed in two or more. Of late years there has been a revival of interest in old lake deposits, which led the author to re-examine the subject and the specimens of the deposits in his possession. Always a supporter of the "interglacial" or successive theory of ice periods, he re-stated his case in the present paper, bringing forward a fresh accumulation of proof.

MESSRS. KING, MENDHAM, AND CO., of the Western Electrical Works, Bristol, have sent us a sample of a very convenient pocket galvanometer which they are now making. It is about the size of an ordinary watch, the ring suspender acting also as a binding screw. It is not only a detector galvanometer, but can be used for the absolute measure of currents up to one ampere. The dial is accordingly graduated one half in degrees, and the other in milliamperes, and is so made that either half can be brought to the top whilst the needle remains in a vertical position. The front portion carries the dial and magnetic needle, and the back part of the case contains the bobbins wound with copper wire, the resistances of which have been measured and particulars furnished with the instrument. Small stands are also supplied for laboratory use if required. The instrument is beautifully finished, and we strongly recommend it to all who use batteries in any shape or form. To those who use electricity for medicinal purposes, where the current is of prescribed strength, such an instrument must be indispensable, and its importance to electric-bell fixers and telephone and telegraph worker is obvious. To economical users of batteries it will recommend itself, as many a good cell may be saved by the detection of the one which is really at fault. Full instructions are supplied with each instrument.

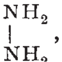
A GOOD word has at last been said for the sparrow in America. In England this impudent bird is decidedly popular, but our kinsfolk in the United States consider him an unmitigated nuisance. Captain W. F. Segrave, British Consul at Baltimore, writing on the subject in a recent Report, warns the Americans that their policy in waging war against the sparrow may prove to be a mistake. "The great 'blizzard' of March 1888," he says, "destroyed multitudes of sparrows, and as a consequence, the past and present summers have seen a vast increase in grubs and caterpillars. Already in many large cities the inhabitants through the public press are complaining of the destruction of their ornamental trees, the diminished number of sparrows being unable to keep in check the vast increase which has taken place in noxious grubs, worms, and caterpillars."

THE third and concluding portion of Prof. Kikuchi's (of Tokio) work on geometry has just reached us. It is entitled "Rittaikikagaku," or "Solid Geometry." He has not been able to derive assistance in its compilation from the work of the Association for the Improvement of Geometrical Teaching, as the syllabus of this subject is yet in an embryo state. If we may judge from the figures, he has adapted portions of Euclid xi., 1-21, and of Wilson's "Solid Geometry," with a brief treatment of the regular solids and the elements of spherical geometry. There is an appendix of the equivalents of English terms written in Japanese and Roman letters.

MESSRS. GURNEY AND JACKSON have in the press "A Handbook of European Birds," by James Backhouse, Jun. The author explains that, having frequently experienced the need of a handy reference volume on European birds, he has been at great pains to meet this want, by endeavouring to produce a complete series of short general descriptions, in a convenient form either for the portmanteau or the pocket. The work will be published by subscription during the autumn or early spring.

THE last published number (31) of *Excursions et Reconnaissances*, the official scientific and learned journal of the French possessions in Indo-China, contains the first of a series of articles, by M. Aymonier, the well-known scholar, on the writing, dialects, history, manners, and customs of the Chams, the ancient masters of Annam proper. The present instalment deals with the grammar, and is illustrated by some lithographs of their writing and their curious cursive alphabets. These are followed by a portion of a Romanized version, with a translation, in French prose, of an Annamite rhymed tragedy.

IN our abstract of the chemical papers at the British Association (p. 587) we gave an account of the paper on alloys read by Messrs. Heycock and Neville. These gentlemen send us the following expansion of our statement:—"(1) Our experiments lead us to the conclusion that the *molecule of aluminium when in solution in tin is* $Al_2 = 54$, and not, as stated, that its atomic weight is different from the accepted value. (2) We stated that the mere application of Raoult's method to alloys does not decide the molecular weight of metals in solution, because we have no standard molecule, of which the molecular complexity in solution is certainly known, to take as unity. By applying Van 't Hoff's theory of solution to alloys of tin, we calculate a number for the fall in the freezing-point produced by one *molecule* of metal in 100 molecules of tin which is almost identical with the constant fall found in our experiments for *one atom* of metal in 100 of tin. Hence we conclude that, with the exception of aluminium, and possibly indium, all the seventeen metals we have examined have single atom molecules when in solution in tin. Our experiments, therefore, in the main, confirm Prof. Ramsay's results obtained by another method, and E. Tamman's results with amalgam."

METHYL HYDRAZINE, $CH_3—NH—NH_2$, the simplest derivative of hydrazine or amidogen,  $\begin{array}{c}NH_2\\ |\\ NH_2\end{array}$, has been isolated by Dr. Gustav von Brüning in the Chemical Laboratory of the University of Wurzburg (*Liebig's Annalen*). It is a clear and very mobile liquid, boiling at 87° C., and possessing a most violent affinity for water, resembling in this respect the recently-isolated hydrazine itself. Its odour is very similar to that of methylamine, and the vapour produces a white cloud in the air due to absorption of moisture to form minute drops of the liquid hydrate. Brought in contact with water, it instantly dissolves with evolution of great heat. It reduces Fehling's solution in the cold, and decomposes nitrous acid with copious evolution of free nitrogen. Its hygroscopic character is so pronounced that it attacks the skin in a most painful manner, and rapidly destroys corks or caoutchouc stoppers. The mode of preparation finally adopted by Dr. von Brüning is in reality very simple, the only difficult operations being those involving its separation from water. It consists in first converting the mono-methyl derivative of urea, $CH_3—NH—CO—NH_2$, into the nitroso-compound, $CH_3—N(NO)—CO—NH_2$; this, upon reduction with zinc dust and glacial acetic acid, yields the corresponding hydrazine urea, which in turn is broken up by boiling with hydrochloric acid into carbonic anhydride, ammonia, and methyl hydrazine. In practice, 50 grams of nitrate of methyl urea are dissolved in warm water, and the solution cooled until crystals begin to form. Crushed ice is then added to keep the temperature as low as possible during the addition of the calculated quantity of solid sodium nitrite; the moment the nitrite is added, the nitroso-compound commences to separate in small yellow lamellæ, and may be obtained recrystallized from ether in much larger slightly yellow tables. The reduction of this nitroso body is then effected by suspending it in water and adding glacial acetic acid and zinc dust, the latter in small portions at a time, with constant agitation. The cold solution, filtered from excess of zinc dust, is then saturated with hydrochloric acid, and afterwards evaporated to a syrupy consistency. The syrup is next boiled for some hours with a concentrated solution of hydrochloric acid in a flask connected with an inverted condenser, after which the liquid is neutralized with a strong soda solution at a low temperature, and sufficient excess of soda added to redissolve the precipitated zinc hydrate. The alkaline solution is then distilled in steam, when the base rapidly and completely passes over, ammonia and methylamine escaping as gases. After removal of most of the dissolved ammonia and methylamine by boiling in the flask supplied with inverted condenser, the base is converted to its acid sulphate, $CH_3—NH—NH_2 . H_2SO_4$, and the crystals of this salt are distilled with a concentrated solution of soda containing pieces of solid sodium hydrate. The last trace of ammonia escapes, while the methyl hydrazine condenses in the cooled receiver. After allowing the distillate to remain in contact with solid soda for twenty-four hours, and then re-subjecting it to distillation, it is still found to contain water. It was, however, finally freed from water by heating to 100° C. in a sealed tube with anhydrous barium oxide.

THE additions to the Zoological Society's Gardens during the past week include a Pigtailed Monkey (*Macacus nemestrinus* ♂) from Java, presented by Mrs. Cosh; three Common Hedgehogs (*Erinaceus europæus*), British, presented by Mr. H. Pelham Curtis; two Cayenne Aracaris (*Pteroglossus aracari*) from Macey, Brazil, presented by Mr. Thomas Watson Permain; a Red and Blue Macaw (*Ara macao*) from Central America, presented by Mr. Robert Romer, Q.C.; a —— Hawk (*Asturina* sp. inc.) from Brazil, presented by Mr. J. E. Wolfe; a Well-marked Tortoise (*Homopus signatus*), a Rufescent Snake (*Leptodira rufescens*), three Smooth-bellied Snakes (*Homalosoma lutrix*), a Many-spotted Snake (*Coronella multimaculata*), a Cape Adder (*Vipera atropos*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; two Macaque Monkeys (*Macacus cynomolgus* ♂ ♀) from India, deposited; six Indian Pythons (*Python molurus*), an Indian Cobra (*Naia tripudians*) from India, purchased.

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## ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 OCTOBER 27—NOVEMBER 2.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

*At Greenwich on October* 27

Sun rises, 6h. 48m.; souths, 11h. 43m. 55·9s.; daily decrease of southing, 4·9s.; sets, 16h. 40m.: right asc. on meridian, 14h. 8·0m.; decl. 12° 57′ S. Sidereal Time at Sunset, 19h. 5m.

Moon (at First Quarter October 31, 9h.) rises, 10h. 12m.; souths, 14h. 29m.; sets, 18h. 39m.: right asc. on meridian, 16h. 54·0m.; decl. 20° 49′ S.

| Planet. | Rises. | | Souths. | | Sets. | | Right asc. and declination on meridian. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | h. | m. | h. | m. | h. | m. | h. | m. | ° | ′ | |
| Mercury.. | 5 | 2 | 10 | 40 | 16 | 18 | 13 | 4·4 | 4 | 56 | S. |
| Venus..... | 4 | 6 | 10 | 4 | 16 | 2 | 12 | 28·0 | 1 | 16 | S. |
| Mars...... | 2 | 38 | 9 | 6 | 15 | 34 | 11 | 29·5 | 4 | 46 | N. |
| Jupiter.... | 12 | 0 | 15 | 53 | 19 | 46 | 18 | 18·3 | 23 | 29 | S. |
| Saturn.... | 0 | 48 | 7 | 54 | 15 | 0 | 10 | 17·4 | 12 | 3 | N. |
| Uranus... | 5 | 41 | 11 | 2 | 16 | 23 | 13 | 26·4 | 8 | 28 | S. |
| Neptune.. | 17 | 58* | 1 | 47 | 9 | 36 | 4 | 9·1 | 19 | 17 | N. |

* Indicates that the rising is that of the preceding evening.